The Royal Institution of Naval Architects

Design & Operation of

Wind Farm Support Vessels

International Conference

Design & Operation of

Wind Farm Support Vessels

27th February 2019,

RINA HQ, London, UK

www.rina.org.uk/Wind_Farm_Vessels2019

Call Catherine on +44 (0) 20 7235 4622 or email conference@rina.org.uk

9:00h - 9:30h **Coffee and Registration.**

9:30h - 10:05h **Technical & Regulatory Development to Support Innovative Offshore Wind Vessel**
Eva Peño, Bureau Veritas, France

Over the last few years offshore wind industry has become a key contributor to the transformation of the world energy sources. This transformation is driven not only by the increased demand of energy coming from emerging countries but also by the increased awareness about of climate change. To keep on developing this industry, offshore wind farms are now moving further from shore and into deeper water. In addition, to fight back against other energy sources, an outstanding effort is requested to the whole supply chain, including vessels serving this industry, to reduce costs. To meet this complex challenge a new generation of highly innovative vessel have seen the light of day.
- New generation of construction vessel with increasing lifting capabilities to deal with turbine sizes that increase by the day.
- Efficient SOV combining high level of operability, low operating cost and advanced transfer logistic solution.
- Crew transfer vessel becoming more polyvalent and providing higher personnel carriage capacity.
What is more, to add more complexity to this challenge, ships supporting the offshore wind industry have also a part to play in terms of footprint reduction. During this presentation we will see how the development of new technologies certainly helps to solve the complex equation that the offshore wind industry is facing today and how classification societies support these developments by providing a constructive regulatory scope to ensure that this innovative vessels can meet this challenge without compromising on safety and while reducing their environmental impact.

10:05h - 10:40h **Development of an Autonomous Wind Farm Supporting Vessel**
Akhil Nair, Luiz Demenicis, Marta Wiecka, David Pugh, Arun Pillai, Houlder Ltd, UK

The present Wind Farm O&M has challenges in delivering cargo safely and efficiently and manning in higher sea states. The movement of Wind Farms further offshore has further increased pressures on vessel design, technicians, safety and costs.
Houlder Ltd have been developing a Wind Farm Support vessel which can operate autonomously during transit and while delivering cargo. The degree of automation aspired is for the vessel to be remotely operating from ashore. User cases have been identified, working in conjunction with industry partners, who are carrying out the logistics analysis, control systems design and LCoE assessments, as part of the Wind Farm Autonomous Ship Project. The concept is expected to reduce operating costs especially fuel and crew related, while improving safety of operations, in the long term.
This paper will particularly focus on the re-think, re-design and refining of vessel design that the autonomous vessel concept has accorded. The discussion will spiral around the design features of spaces, stability, structure and machinery systems, besides discussing the innovative cargo handling solution for autonomous cargo delivering.

10:40h - 11:10h **Coffee**

10:10h - 11:45h **CTV Operational Experience from 7 to 27m with Stern Drives and Pod Drives**
Gerard Törneman, AB Volvo Penta, Sweden

The distance to the offshore windfarm sites as well as the size of installation and support vessels are constantly increasing. Today you can find vessels up to 100m, all vessels being perfectly suited for its tailored task.
This paper will present Crew Transfer boats, ranging from 7m to 27m, purpose built for its operation and designed for efficient crew transfer, from shore or from hotel ships to windfarm structures, platforms or special operation vessels. The paper will focus on vessels using active drive systems as sterndrives or pod drives, showing how they work safely and efficiently in crew transit and crew transfer operations.
With contra rotating stern drives and contra rotating pod drives the active maneuvering in high seas and the high bollard push against any boarding structure will ensure that the downtime due to bad weather is minimized and the safety for the crew and technicians are kept on a high level. The CR technology will ensure that vessels are keeping their the grip in the water, having an excellent bollard push and at the same time showing up to 30% lower fuel consumption
Monohull and catamaran vessels will be presented together with selected propulsion system and experience from real operation in different duties will be shown.
The paper will give a good insight in the performance and the flexibility of the stern drive and pod drive propulsion system in different operations , with over 10 years of experience in offshore wind environment. It will also show the future of an electromobility concept for parallel hybrids in this kind of applications.

11:45h - 12:20h **A Comparative Assessment of Crew Transfer Vessel Motions Between Inclined and Vertical Boat Landing Arrangements**
Dr Olgun Hizir, University of Strathclyde UK
Mr Matthias Maasch, Prof Osman Turan, Prof Sandy Day, University of Strathclyde UK
Mr Ian Nicholls, Scottish and Southern Energy (SSE), UK

Crew Transfer Vessels (CTV) are an essential part of operations and maintenance activities for offshore wind farms. CTVs, which are generally multihull vessels transport crew from shore to offshore wind farm sites to carry out the maintenance and repair activities. CTVs thrust onto turbine structures from the rendered bow and push against the structure creating frictional thrust to prevent the bow from heaving. If the resultant hydrodynamic forces are exceeding the friction force generated by the CTV in bollard push position, CTV bow will start heaving. This will create difficulties with landing the crew beyond a certain wave height.
CTVs generally land on vertical or inclined landing structures attached to offshore wind turbine foundations. This study presents and discusses the results from a set of model experiments and numerical calculations to allow a comparative assessment of a CTV's landing-manoeuvre performance between inclined and vertical boat landing arrangements. The hydrodynamic performance of a CTV in open water and the "thrust-in" condition using inclined and vertical landing arrangements are presented for different vessel thrust force and different fender properties.

12:20h - 13:20h **Lunch**

13:20h - 13:55h **Developing the Next Generatiion of CTVs**
Sarah Daubney, CWIND, UK

CWind presents its innovation-based strategy and design for a hybrid surface effect vessel (SE CTV). The paper will highlight the challenges of transferring larger technician teams safely to and from shore, for construction and O&M phases, for increasing capacity WTGs.
1) Why is it desirable to the industry to increase the wave height that CTVs can transfer in, and how is the supply chain currently working to achieve this? Discussion of larger vessels, bigger engines and heavier displacement trends. Review of the current market trends, options and vessel design, as well as discuss the advent of new technologies offering improved economy, increased operational limits and transit comfort.
2) Mechanics of the transfer, simplifying the problem to that of Newtonian friction equation. This will then lead on to the intuitive phases of increasing friction forces between vessel and fender, and minimising the vessel excitation by wave motion through SES technology. These are the pillars of the CWind strategy.
3) Current progress with SE CTV prototype and fender trials progress. This section will talk about the benefits, challenges and additional unexpected gains from the strategy to date. This includes less CO2, mechanical wear and crew comfort.
The paper will provide insight to the reader into current vessel issues facing the growing offshore wind, offer an understanding of new technologies including the SE CTV concept and the inherent design advantages, as well as provide alternative thinking and innovative solutions for designing the CTV of the future.

13:55h - 14:30h **Microbubble – A Unique Technology for Reducing Vessel Drag**
Wenxian Yang, Newcastle University, UK

Wind farm service vessel has stricter requirement on seakeeping, which accounts for the popular application of catamarans in offshore wind farms today. However, despite the small water plane area catamarans still suffer larger drag in transport compared a mono-hull vessel of the similar size, which would increase fuel consumption therefore the maintenance costs of offshore wind farms. Microbubble technology provides a potential solution for this issue. Its basic idea is to apply microbubbles to the bottom and sides of the vessel to change the turbulent structure in the boundary layer thus effectively reduce the hull resistance. So far, early effort has been made in this field by conducting model tests in still water. However, it still lacks a clearly understanding of how bubble control affects drag reduction. In addition, whether this technique can continue to work effectively in waves is also unclear. The purpose of this paper is to fill this gap of technology by systematically conducting a series of research to investigate the influences of microbubble size, density, velocity and air inlet size on vessel drag in both still water and waves. It has been found that increasing microbubble density and initial velocity and reducing the area of the air inlet will increase the local bubble volume fraction, thus lead to the reduction of drag. The increase of wave height will significantly increase vessel drag. However, obvious influence of microbubble size on the drag is not observed.

15:00h - 15:35h **Battery Hybrid Propulsion for High-Speed vessels.**
Bjørn Svendsen, BRUNVOLL, Sweden

Hybrid propulsion systems benefit of the best from two systems - the combination of electric propulsion and diesel drive.
The Brunvoll Triton Hybrid system enables ships with variable power requirements to run at high propeller efficiency. In such a system design the vessel can utilize the power required for the specific operation in pure electric mode, or in diesel mechanical mode, or in a boost mode by engaging both systems.
The system configuration is a fuel efficient and flexible system, with high redundancy.
The system is a standardized hybrid package for propulsion with hotel load supply and charge interface to shore connection. The design is compact with focus on weight and volume opti¬mal for high speed vessels. Integrated system design with focus on control philosophy, fuel savings and ergonomics.

15:35h - 16:10h **Targets not included!**
Sasha Heriot, Guidance Marine Ltd, UK

The latest technology in local position reference sensing is changing the way that vessels operate alongside assets, whether that be an oil platform, another vessel or an offshore wind turbine. These technologies allow local positioning to be completely independent of the asset which enables safer, more efficient operations as well as reducing costs for the asset owner. SceneScan, launched in 2018, is the first laser local position reference sensor that does not require a physical reflective target to be placed on the asset to operate; this offers many operational advantages. It follows the success of the first targetless sensor, RangeGuard Monopole which is used for SOV operations at offshore wind farms, launched in 2016 and uses radar technology. This paper describes SceneScan Monopole which is a special feature included with the standard SceneScan software that allows SceneScan to be used for SOV operations at a windfarm. With the launch of SceneScan Monopole, Wärtsilä Guidance Marine can now offer a completely targetless solution for SOV's. Using RangeGuard Monopole alongside SceneScan Monopole provides two forms of redundancy (laser and radar), and is not reliant on GPS, fulfilling DP2 requirements.

Conference Overview

In the space of less than a decade, wind farm support vessels (WFSVs) have gone through leaps and bounds when it comes to refined, innovative design.
The 2008-2013 period saw a significant change in the definition of the 'average' WFSV –from repurposed fishing craft and workboats, to dedicated vessels capable of handling higher seas, harsher waves and longer transits than their converted counterparts. This innovation was born of necessity, as offshore wind turbine arrays moved further offshore, and into increasingly remote, deep-water.

UK and European naval architects and builders spearheaded the majority of these design breakthroughs, in response to the booming renewable energy business on their back doorsteps. Technician complements were increased from a standard number of 12 to 24 or more. Walk-to-work/gangway systems were increasingly adopted and, compared to some vessel sectors, the WFSV enjoyed a particularly clean sheet in general when it came to safety in the field.

By 2016, though, Ship & Boat International was arguing that "the ability to produce similar 24m WFSVs is no longer enough for the energy majors, who now expect builders to tick all the operational boxes at once – more speed, more safety features, more operational efficiency, more flexibility." The middle of the decade saw WFSV demand dip below supply in Europe, causing a temporary plateau in this boat sector.

Consequently, 2015-2016 was to prove a reflective period in which, rather than 'churning out' proven WFSV units en masse, design teams continued to push for increasingly innovative solutions.

The UK and European wind farms, and their related supply chains, are certainly well established. Now, the US and the Asia-Pacific are set to repeat this success, only on a far grander scale, and demand for safe, reliable and cost-efficient WFSVs is back on the agenda.
Substantial offshore wind farm growth within these territories could offer exciting opportunities for those UK and European designers who've gained invaluable experience of developing fit-for-purpose WFSVs. However, don't discount the ability of these emerging markets to match European design expertise blow for blow – and, in the case of some Asian yards, to do so with the bonus of significantly lower production costs. Welcome to 'Phase 2' of the global race to develop the most optimised WFSVs possible.

International Conference

DESIGN & OPERATION OF WIND FARM SUPPORT VESSELS

27th February 2019, RINA HQ, London, UK

To register, simply complete all sections of this form and return it with your payment to:

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